NASA Procedural Requirements

NPR 8570.1
Effective Date: March 15, 2001
Expiration Date: March 15, 2007

COMPLIANCE IS MANDATORY

Printable Format (PDF)

Subject: Energy Efficiency and Water Conservation w/Change 1 (3/30/04)

Responsible Office: Environmental Management Division

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CHAPTER 1. Introduction

1.1 Energy Efficiency and Water Conservation

1.1.1 Conservation is one of the four principal areas of NASA's Environmental Strategy. Conservation is the essence of good stewardship for all the resources NASA controls and reduces the impact of Agency activities on the environment. NASA will strive to improve its energy efficiency and water conservation practices in order to save taxpayer dollars, reduce emissions that contribute to air pollution and global climate change, and conserve precious natural resources for future generations.

1.1.2 In carrying out their assigned energy efficiency and water conservation responsibilities, the following objectives are of special concern to energy managers and facilities maintenance personnel:

a. Minimize energy and water consumption without affecting safety or mission operations.

b. Make personnel aware of the importance of limiting energy and water use to the minimum requirements.

1.1.3 To sustain NASA's state-of-the-art research mission, energy efficiency and water conservation measures must be implemented to --

a. Modernize aging facilities and infrastructure using innovative resources,

b. Maximize funds allocated to NASA Programs and Projects through reduced expenditures for energy and utilities services, and

c. Demonstrate environmental stewardship.

1.1.4 In light of extremely limited appropriations for facility and infrastructure investment, NASA is committed to implementing cost-effective energy efficiency and water conservation measures by utilizing innovative funding sources and initiatives, such as the following:

a. Partnering with other agencies,

b. Utilizing Energy Savings Performance Contracts (ESPC) and Utility Energy-Efficiency Service Contracts (UESC),

c. Increasing employee awareness,

d. Reducing the cost of purchased utilities, and

e. Utilizing alternate fuels and renewable energy technologies.

1.2 Agency Goals

1.2.1 It is NASA's policy to fully comply with the requirements of the NECPA, as amended by the EPACT, EO

13123, "Greening the Government Through Efficient Energy Management," and other statutory and Presidential requirements regarding energy efficiency and water conservation. A summary of pertinent legislation and Executive Orders is included as Appendix A. NASA will strive to reduce energy and water consumption and cost whenever possible in all facility operations. The following goals will be pursued at NASA Headquarters, NASA Centers, Component Facilities, and offsite program facilities:

a. Reduce greenhouse gas emissions attributed to facility energy use by 30 percent by FY 2010, compared to such emission levels in FY 1990.

b. Reduce overall energy use per gross square foot in nonmission variable buildings/facilities 20 percent by FY 2000, 30 percent by FY 2005, and 35 percent by FY 2010, relative to FY 1985 levels.

c. Improve the energy efficiency of energy-intensive buildings/facilities 20 percent by FY 2005 and 25 percent by FY 2010, relative to FY 1990 levels.

d. Improve the energy efficiency of mission variable buildings/facilities 10 percent by FY 2005, relative to FY 1985 levels, and otherwise reduce energy and water waste where cost-effective and without adversely affecting mission performance. This goal does not apply to wind tunnel facilities due to the technical and economic unfeasibility of achieving significant energy efficiency improvement in their design and construction over the required time period and the overwhelming proportion of process-dedicated energy associated with their operation.

e. Expand the use of renewable energy for facilities and operational activities by implementing renewable energy projects and by purchasing electricity from clean, efficient, and renewable energy sources.

f. Reduce the use of petroleum in facility operations by switching to a less greenhouse gas-intensive, nonpetroleum-based energy source where practical and cost-effective and by otherwise improving the efficiency with which petroleum is used.

g. Reduce water consumption and associated energy use by implementing appropriate Best Management Practices (BMP) identified by the Department of Energy (DOE).

h. Conduct energy and water audits for approximately 10 percent of total facilities' gross square footage each year until all facilities have been audited. Audits will be performed independently or through ESPC or UESC.

i. Initiate action to implement all identified energy efficiency and water conservation recommendations with payback periods of less than 10 years by January 1, 2005.

j. Use life-cycle cost analysis in making investment decisions on products, services, construction, and Operations and Maintenance (O&M) practices that significantly affect energy and water usage, so that mission requirements will be satisfied at the lowest life-cycle cost.

k. In accordance with NDP 8820.3, apply sustainable design principles to the siting, design, and construction of new facilities, and where practical, to the rehabilitation and modification of existing facilities, to optimize life-cycle costs, prevent pollution, and minimize energy and water usage throughout their useful life.

l. Where cost-effective over the life cycle, select ENERGY STAR(r) and other energy-efficient products in the upper 25 percent of energy efficiency and products with low standby power requirements as designated by the Environmental Protection Agency (EPA) or DOE.

1.3 Units of Measure and Conversion Factor

1.3.1 Energy sources typically used in NASA facilities, vehicles, and equipment are defined by common units of energy to provide a means for comparison. Table 1-1 lists these energy and fuel types by the DOE reporting units and their energy content in English and metric units.

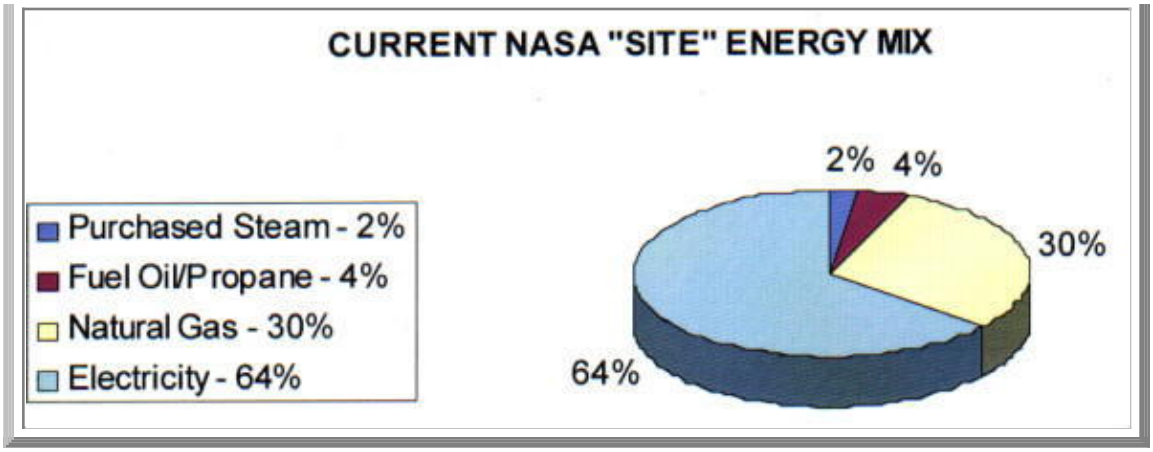
Energy or Fuel Type	DOE Reporting Units	British Thermal Units (BTU) per Reporting Unit	Joules per Reporting Unit	GigaJoules (GJ) per Reporting Unit

Buildings/Facilities
Excluded Buildings/Industrial

Electricity	Megawatt Hour (MWH)	3,412,000	3,599,660,000	3.59966
Fuel Oil	1,000 Gallons	138,700,000	146,328,500,000	146.3285
Natural Gas	1,000 Cubic Feet	1,031,000	1,087,705,000	1.087705
Liquefied Petroleum Gas (LPG)/Propane	1,000 Gallons	95,500,000	100,752,500,000	100.7525
Coal	Short Ton	24,580,000	25,931,900,000	25.9319
Purchased Steam	Billion British Thermal Units (BBTU)	1,000,000,000	1,055,000,000,000	1,055.0
Other	BBTU	1,000,000,000	1,055,000,000,000	1,055.0

Vehicles/Equipment

Auto Gas	1,000 Gallons	125,000,000	131,875,000,000	131.875
Diesel	1,000 Gallons	138,700,000	146,328,500,000	146.3285
LPG/Propane	1,000 Gallons	95,500,000	100,752,500,000	100.7525
Aviation Gas	1,000 Gallons	125,000,000	131,875,000,000	131.875
Jet Fuel	1,000 Gallons	130,000,000	137,150,000,000	137.150
Navy Special	1,000 Gallons	138,700,000	146,328,500,000	146.3285
Other	BBTU	1,000,000,000	1,055,000,000,000	1,055.0



1.3.23 NASA Headquarters uses the standard energy conversion factors shown in Table 1-1 in reporting Agency energy use to DOE. When the actual energy content of fuels and purchased nonelectric utilities used by the Center deviates from these standards, Centers may adjust the energy consumption units reported to Headquarters to account for this difference using the formula: Reported Consumption Units equals Actual Consumption Units multiplied by DOE Energy Conversion Factor divided by Actual Energy Conversion Factor.

1.4 Center and Component Facility Responsibilities

1.4.1 Centers and Component Facilities are responsible for achieving the Agency energy efficiency and water conservation goals specified in paragraph 1.2 at the local level. In addition, each Center and Component Facility shall accomplish the following:

a. Appoint an energy manager for the Center or Component Facility to serve as the focal point for all energy matters and to manage and monitor energy consumption and conservation.

b. Perform energy surveys and identify, request funds for, and implement energy-efficiency and water conservation measures that are cost-effective over the life cycle.

c. Determine appropriate facility designations for energy reporting purposes and justify each mission variable building/facility exemption claimed.

d. Survey petroleum-consuming facilities to identify opportunities to switch to a less greenhouse gas-intensive, nonpetroleum-based energy source where practical and cost-effective.

e. Investigate the technical and economic viability of entering into ESPC's and UESC's.

f. Ensure that new facilities are designed and constructed to comply with the Federal energy performance standards set forth in 10 CFR 434 Energy Code for New Federal Commercial and Multi-Family High Rise Residential Buildings.

g. Implement an awareness program to reduce waste in onsite energy and water use by Federal and contractor employees.

h. Submit required energy efficiency and conservation management information to Headquarters. Reporting requirements are identified in chapter 2.

i. Prepare a 5-year Energy Efficiency and Water Conservation Plan and update on a maximum 3-year interval. Requirements for preparing Center Plans is provided in chapter 3.

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